ANNUAL REPORT FOR 2005

Wiggins Mill Mitigation Site
Wilson County
Project No. 8.1330509
TIP No. R-1030WM

Natural Environment Unit & Roadside Environmental Unit
North Carolina Department of Transportation
December 2005

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SUMMARY

The following report summarizes the monitoring activities at the Wiggins Mill Mitigation Site. This site was constructed in the fall of 2000 to provide wetland mitigation for U-3472 and R-1030. Planting activities were completed in March 2001. The 2005-year reflects the fifth complete year that monitoring has taken place on the site.

The daily rainfall data depicted on the gauge data graphs is recorded by an onsite rain gauge installed prior to the 2001-growing season. Additional rainfall data from a rain gauge located in Wilson, NC was provided by the NC State Climate Office and was used to determine the average rainfall range for the site. Based on this data, Wilson experienced a below average rainfall year in 2005.

The site was monitored using eighteen hydrologic monitoring gauges. In early Spring 2002, four additional gauges were added to the original eighteen. During the 2005 monitoring season, all of the groundwater-monitoring gauges indicated saturation within 12" of the surface for more than 5% of the growing season (hydrology success as stated in the mitigation plan). Twenty of the twenty-two gauges resulted in saturation for greater than 12.5% of the growing season during a below average rainfall year.

Eleven vegetation plots were established to monitor the 84 acres planted in trees on the site. The 2005 vegetation monitoring revealed an average density of 509 trees per acre, with two of the eleven plots not meeting the success criteria. The overall average density is above the minimum success criteria of 240 trees per acre.

Stream remediation work was initiated in November 2004 and was completed in February 2005. The streambanks were live staked and several remediation areas were supplementally planted with appropriate tree species.

The stream visual monitoring indicated that the streambanks were stable with substantial woody and herbaceous vegetation throughout the entire length of the stream.

An on-site agency meeting was held in August 2005 to review the stream remediation work. During the site visit, the following were reviewed for agency approval: the new log vane structure installations, the streambank repair areas, the open water habitat areas, and the remedial planting. Following the stream monitoring for the 2005-monitoring year, the agencies agreed that NCDOT could propose to discontinue monitoring of the stream.

Based on the hydrologic, vegetation, and streambank monitoring, the Wiggins Mill Mitigation Site met the success criteria during the 2005-growing season. The site has demonstrated both hydrologic and vegetation success for five consecutive years. NCDOT proposes to discontinue all monitoring on the Wiggins Mill Mitigation Site.

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Wiggins Mill Mitigation Site is located in Wilson County, south of the Wiggins Mill Reservoir and southwest of the City of Wilson. It encompasses approximately 89 acres (Figure 1). The site grading was completed in October 2000 and planting in March 2001.

The site serves as mitigation for U-3472 and R-1030. It includes 84 acres of small stream swamp hardwood (1st and 2nd order streams), bottomland hardwood, swamp hardwood, and headwater forest/low elevation seep wetland communities restoration, 5.3 acres of bottomland hardwood enhancement, 7,020 linear feet of stream restoration, and 11.31 acres of buffer restoration.

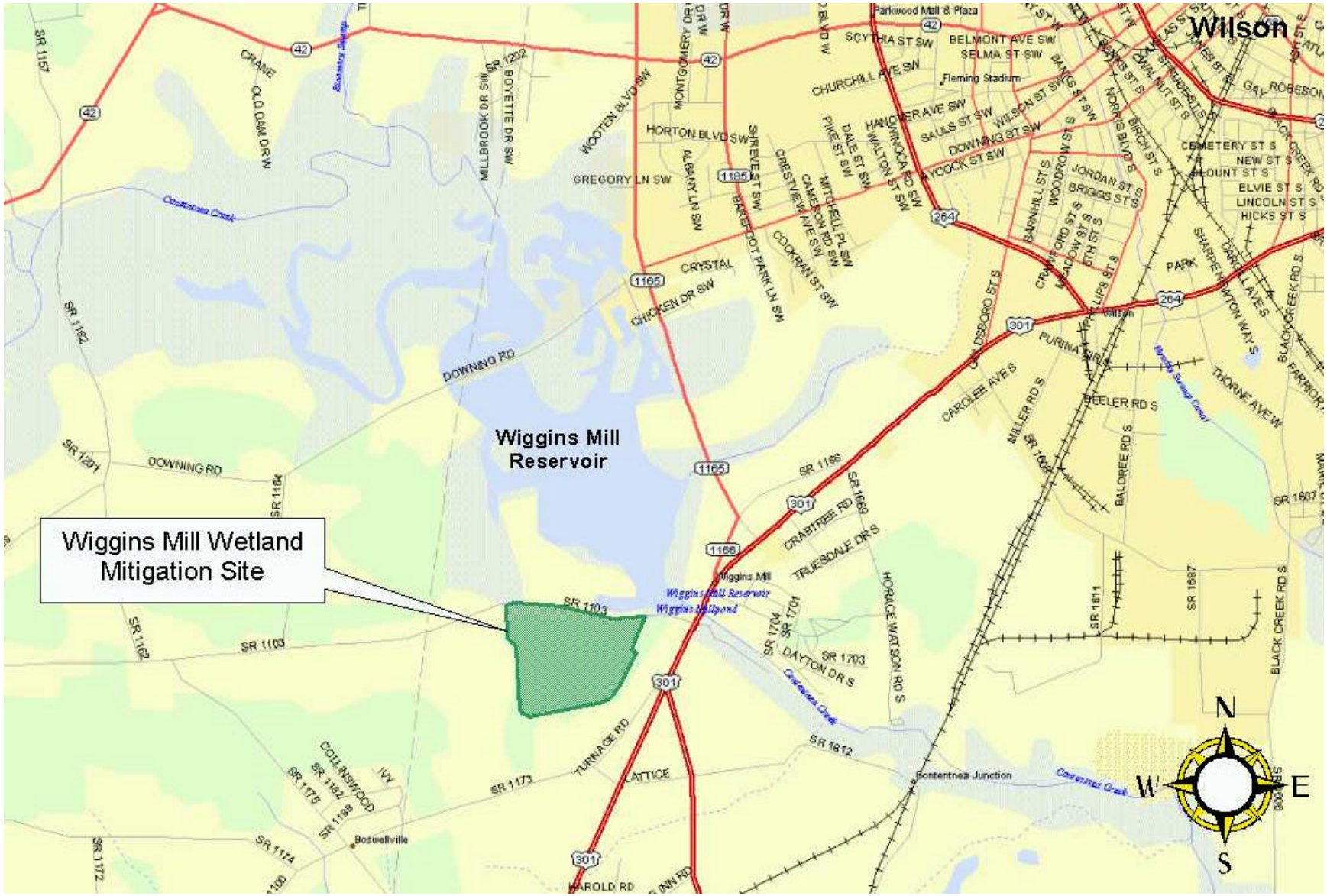
1.2 PURPOSE

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until the site is deemed successful. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during the 2005-growing season at the Wiggins Mill Mitigation Site. Included in this report are analyses of both hydrologic and vegetative monitoring results, as well as local climate conditions throughout the growing season, and site photographs.

1.3 PROJECT HISTORY

October 2000	Site Grading Completed
February 2001	Herbicide Application
March 2001	Monitoring Gauges Installed
March 2001	Site Planted
March - November 2001	Hydrologic Monitoring (1 yr.)
July 2001	Vegetation Monitoring (1 yr.)
March - November 2002	Hydrologic Monitoring (2 yr.)
June 2002	Vegetation Monitoring (2 yr.)
March - November 2003	Hydrologic Monitoring (3 yr.)
July 2003	Vegetation Monitoring (3 yr.)
March - November 2004	Hydrologic Monitoring (4 yr.)
September 2004	Vegetation Monitoring (4 yr.)
November 2004	Remediation Thread A
March - November 2005	Hydrologic Monitoring (5 yr.)
February 2005	Supplemental Planting Remediation Areas
August 2005	Vegetation Monitoring (5 yr.)

Figure 1. Site Location Map



2.0 HYDROLOGY

2.1 SUCCESS CRITERIA

In accordance with federal guidelines for wetland mitigation and the wetland mitigation plan (entitled "North Carolina Department of Transportation (NCDOT) Wiggins Mill Mitigation Plan Wilson County, North Carolina", dated February 1, 1999), the success criteria for hydrology state that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 5% of the growing season. This success criteria was agreed upon as part of the special conditions set forth by the Corps of Engineers (COE) through their issuance of permits for NCDOT's TIP projects U-3472 and R-1030.

The growing season in Wilson County begins March 20 and ends November 12. These dates correspond to a 50% probability that temperatures will remain above 28° F or higher after March 20 and before November 12.[1] The growing season is 236 days; therefore, the minimum duration for 5% of the growing season is 12 consecutive days.

2.2 HYDROLOGIC DESCRIPTION

Eighteen monitoring gauges were installed on the site in March 2001 (Figure 2). Four additional groundwater gauges were installed in Spring 2002 (WM-G19, WM-G20, WM-G21, WM-G22). These gauges were installed, based on comments from the agency review meeting, in between marginal gauges and gauges that failed to meet the success criteria in 2001.

The automatic monitoring gauges record daily readings of the groundwater depth.

2.3 RESULTS OF HYDROLOGIC MONITORING

2.3.1 Site Data

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 236-day growing season (March 20 – November 12). Table 1 shows the hydrologic results for 2005.

Figure 3 provides a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in red show hydrology between 8% and 12.5% of the growing season, while those in green indicate hydrology between 5% and 8%.

[1] Soil Conservation Service, Soil Survey of Wilson County, North Carolina, p.79.

Figure 2. Wiggins Mill Site Gauge Location Map

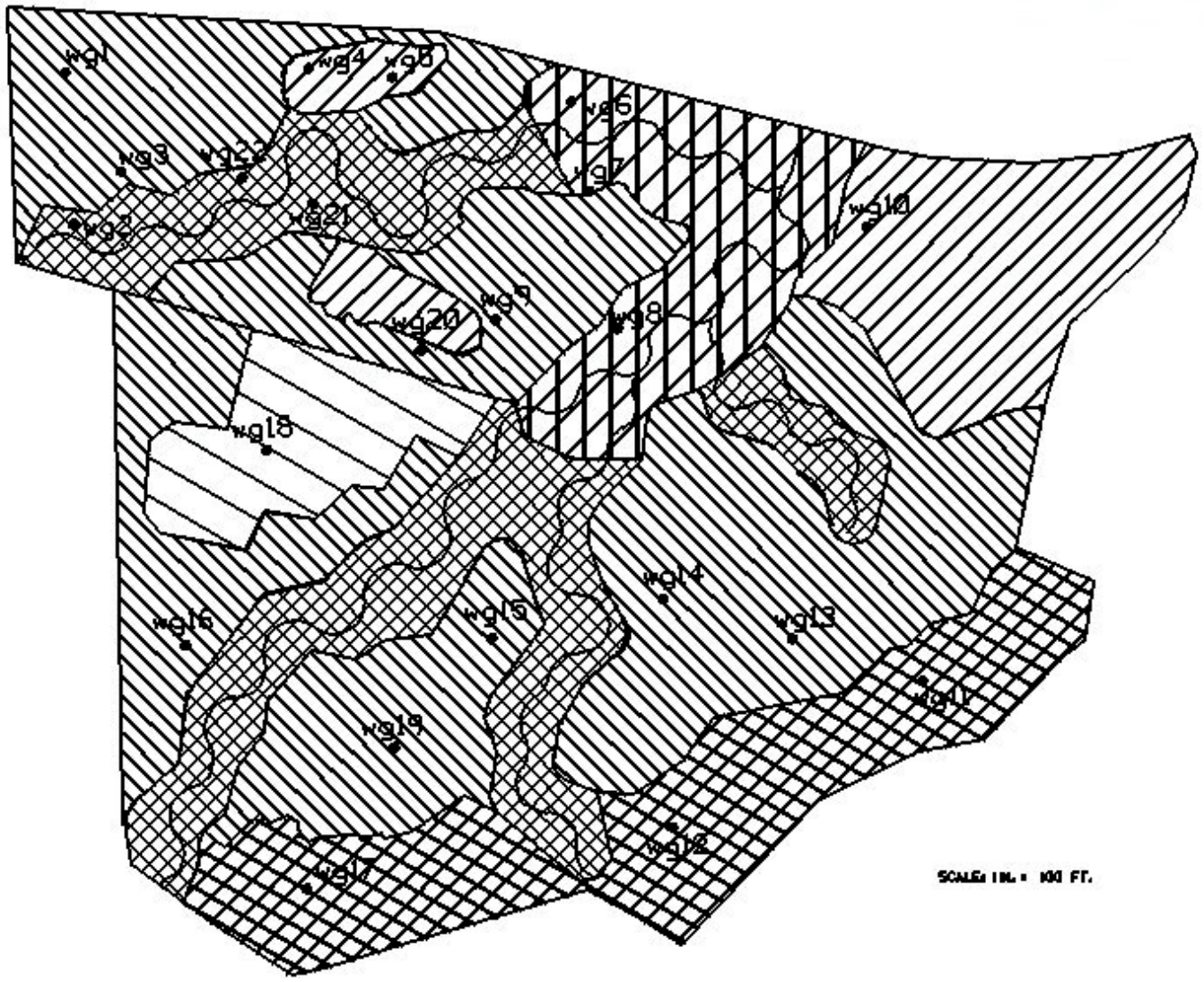


Table 1. 2005 Hydrologic Monitoring Results

Monitoring Gauge	< 5%	5 – 8%	8 – 12%	> 12.5%	Actual %	Success Dates
WM-G1+				✕	14.0	March 20-April 21
WM-G2+				✕	15.3	March 20-April 24
WM-G3+				✕	14.0	March 20-April 21
WM-G4+				✕	19.1	March 20-May 3 May 6-May 27
WM-G5+				✕	16.9	March 20-April 28 May 6-May 27
WM-G6+				✕	19.1	March 20-May 3 May 6-May 28
WM-G7+				✕	41.1	March 20-June 24
WM-G8+				✕	25.8	March 20-May 19 Oct 8-Nov 5
WM-G9+				✕	29.7	March 20-May 28 June 2-June 17
WM-G10+				✕	51.7	March 20-July 19 Oct 8-Nov 10
WM-G11+				✕	32.2	March 20-June 3
WM-G12+				✕	13.1	March 20-April 19
WM-G13+				✕	30.5	March 20-May 30 June 2-June 17
WM-G14+				✕	14.8	March 20-April 23
WM-G15+				✕	16.5	March 20-April 27
WM-G16			✕		10.2	March 20-April 12
WM-G17+				✕	50.4	March 20-July 16 July 23-Aug 11 Oct 8-Nov 6
WM-G18+				✕	13.1	March 20-April 19
WM-G19+				✕	38.6	March 20-June 18
WM-G20			✕		10.6	Sept 19-Oct 12
WM-G21+				✕	29.7	March 20-May 28 June 2-June 15
WM-G22+				✕	29.7	March 20-May 28 June 2-June 15

+ Gauge met success criterion during an average rainfall month (April, May, and October).

Table 2. Hydrologic Monitoring Results (2001-2005)

Monitoring Gauge	2001 Results	2002 Results	2003 Results	2004 Results	2005 Results
WM-G1	3.8	9.7	19.1	10.2	14.0
WM-G2	4.0	6.3	11.9	6.4	15.3
WM-G3	3.4	13.9	19.1	10.6	14.0
WM-G4	6.8	13.9	22.9	42.4	19.1
WM-G5	6.4	13.9	25.4	14.4	16.9
WM-G6	5.1	13.9	21.6	16.1	19.1
WM-G7	4.2	13.5	19.1	23.7	41.1
WM-G8	10.2	14.3	25.8	47.0	25.8
WM-G9	4.2	13.5	15.3	25.4	29.7
WM-G10	7.2	13.9	22.9	29.2	51.7
WM-G11	38.6	32.8	100	100	32.2
WM-G12	10.2	15.5	31.8	40.3	13.1
WM-G13	8.0	13.9	23.3	42.4	30.5
WM-G14	5.9	12.2	22.5	10.6	14.8
WM-G15	4.7	13.5	22.5	11.0	16.5
WM-G16	5.1	13.2	19.1	9.7	10.2
WM-G17	39.0	33.0	100	47.0	50.4
WM-G18	10.2	13.5	22.5	30.9	13.1
WM-G19	-	13.5	42.4	41.1	38.6
WM-G20	-	8.8	6.8	10.2	10.6
WM-G21	-	13.5	22.0	42.4	29.7
WM-G22	-	13.5	22.0	38.1	29.7

- Gauge was not installed

Table 2 represents hydrologic data in percentages from previous years (2001-2005).

2.3.2 Climatic Data

Figure 4 is a comparison of monthly rainfall for the period of November 2004 through November 2005 to historical precipitation (collected between 1974 and 2005) for Wilson, North Carolina. This comparison gives an indication of how 2005 relates to historical data in terms of average rainfall. The NC State Climate Office provided all historical data.

For the 2005-year, December (04'), January, February, March, June, July, August, and September experienced below average rainfall. The months of November (04'), April, May, and October recorded average rainfall for the site. November experienced above average rainfall. Overall, 2005 experienced a below average rainfall year.

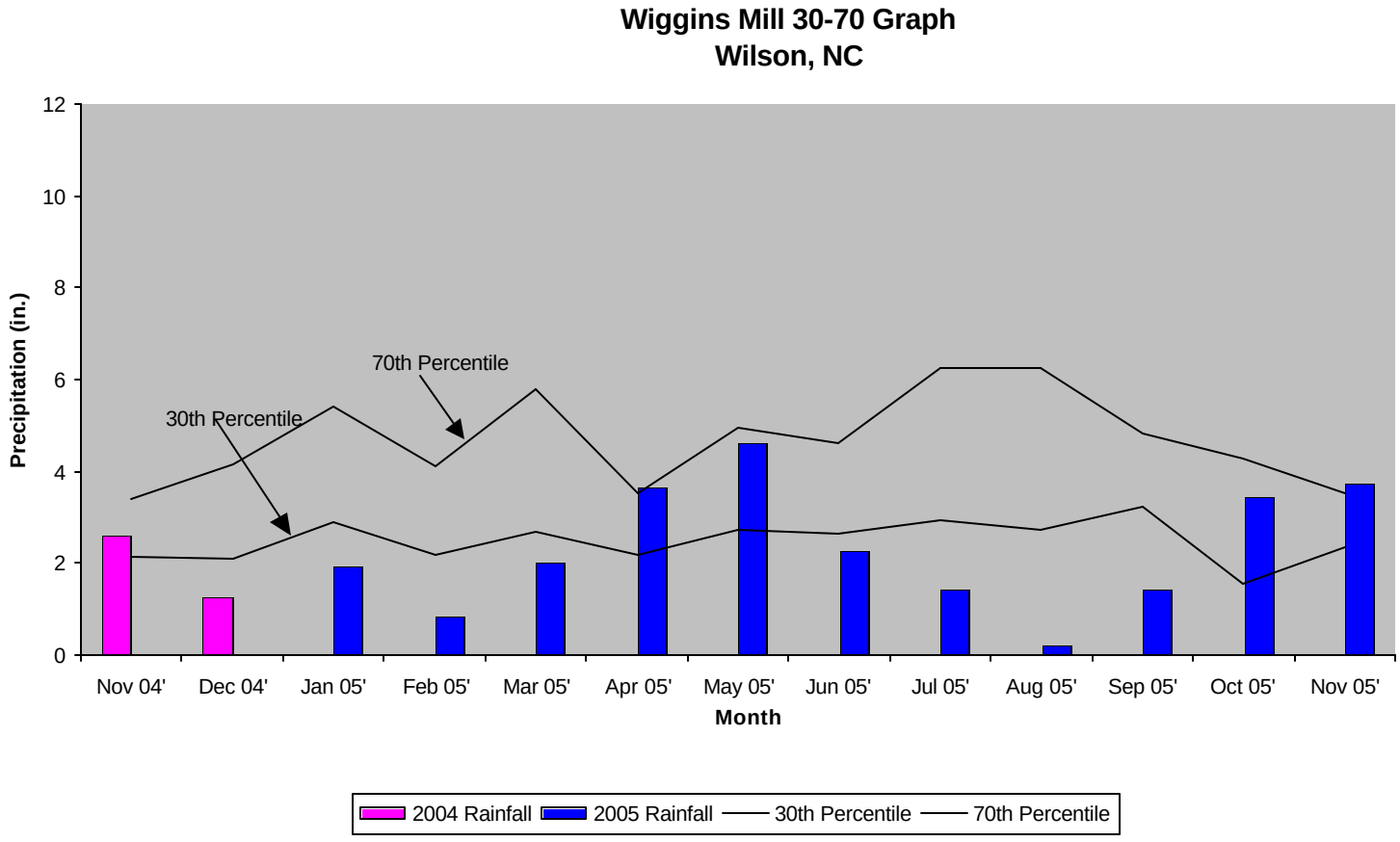
2.4 CONCLUSIONS

The 2005-year is the fifth successful year of hydrologic monitoring on the Wiggins Mill Mitigation Site. All twenty-two groundwater-monitoring gauges met the success criteria and indicated saturation within 12" of the surface for more than 5% of the growing season. Twenty of the twenty-two gauges resulted in saturation for greater than 12.5% of the growing season during a below average rainfall year.

NCDOT proposes to discontinue hydrologic monitoring at the Wiggins Mill Mitigation Site.

Figure 3

Figure 4. 30-70 Percentile Graph



3.0 VEGETATION: WIGGINS MILL MITIGATION SITE (YEAR 5 MONITORING)

3.1 SUCCESS CRITERIA

Success criteria state that at least 320 stems per acre must survive after the completion of the third growing season and 240 stems per acre after the fifth growing season. If desired vegetation has not been established, NCDOT will notify the appropriate agencies and will implement corrective measures.

3.2 DESCRIPTION OF SPECIES

The following tree species were planted in the Wetland Restoration Area:

Zone 1: Headwater Forest (12 acres)

Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Betula nigra, River Birch
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Quercus nigra, Water Oak
Quercus phellos, Willow Oak

Zone 2: Bottomland Hardwood (39 acres)

Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Liriodendron tulipifera, Tulip Poplar
Quercus nigra, Water Oak
Quercus phellos, Willow Oak
Quercus lyrata, Overcup Oak

Zone 3: Swamp Hardwood (10 acres)

Taxodium distichum, Baldcypress
Quercus lyrata, Overcup Oak
Nyssa sylvatica var. *biflora*, Swamp Black Gum
Nyssa aquatica, Water Tupelo
Quercus laurifolia, Laurel Oak
Quercus phellos, Willow Oak

Zone 4: Small Stream Swamp (1st order)

Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Quercus nigra, Water Oak

Quercus phellos, Willow Oak
Liriodendron tulipifera, Tulip Poplar

Zone 5: Small Stream Swamp (2nd order)

Taxodium distichum, Baldcypress
Quercus lyrata, Overcup Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Quercus phellos, Willow Oak

3.3 RESULTS OF VEGETATION MONITORING

Table 3. 2005 Vegetation Monitoring Results

ZONE	Plot #	Green Ash	Laurel Oak	River Birch	Swamp Blackgum	Water Oak	Willow Oak	Tulip Poplar	Baldcypress	Overcup Oak	Water Tupelo	Total (5 year)	Total (at planting)	Density (Trees/Ac
1	10		7			1	20	2				30	38	537
	11	5	4		1	1	11					22	32	468
							Zone 1 Average							**503**
2	1		1		2		1	7		7		18	36	340
	7	15				1	13	1		8		38	40	646
	9	1	1				1					3	39	52
							Zone 2 Average							**346**
3	2		1		2		1		6	21		31	38	555
	5				5				9		3	17	50	231
							Zone 3 Average							**393**
4	3	2	5		6	6	9	19		1		48	49	666
	8	2	3		6	12	10	7		5		45	47	651
							Zone 4 Average							**659**
5	4	23	6		1		8		9	2		49	50	666
	6	8	3		3		10		18	2		44	48	623
							Zone 5 Average							**645**
							Total Density Average							**509**

Site Notes:

Zone 1: Other species noted: fennel, trumpet creeper, morning glory, horse-nettle, hickory, holly, *Juncus sp*., woolgrass, briars, *Baccharis* sp., smart weed, goldenrod, and pokeberry.

Zone 2: Other species noted: horse-nettle, fennel, bitter sneezeweed, broomsedge, goldenrod, *Juncus* sp., ragweed, woolgrass, wax myrtle, cattails, *Pluchea* sp., *Baccharis sp*., trumpet creeper, swamp chestnut oak, pine, and pokeberry. Plot 9 has a large amount of herbaceous competition, which seems to be affecting the survival rate of the trees within the plot. By visual observation a large number of trees were noted living outside of plot 9, which included, willow oak, laurel oak, tulip poplar, and green ash.

Zone 3: Other species noted: horse-nettle, fennel, goldenrod, *Baccharis* sp., pine, bitter sneezeweed, pokeberry, trumpet creeper, *Juncus* sp., poison ivy, broomsedge, and winged sumac. Trees planted in areas surrounding Plot 5 appear to have a much higher survival rate than those in Plot 5. Plot 5 does not provide an adequate representation of the survival within Zone 3.
Zone 4: Other species noted: *Baccharis* sp., pine, *Juncus* sp., fennel, and ragweed
Zone 5: Other species noted: woolgrass, fennel, pine, wax myrtle, and *Juncus* sp.

3.4 CONCLUSIONS

Of the 89 acres on this site, approximately 84 acres involved tree planting. There were eleven vegetation-monitoring plots established throughout the planting areas. The 2005 vegetation monitoring of the site revealed an average tree density of 509 trees per acre. This average is well above the minimum success criteria of 240 trees per acre.

Remediation work was completed in February 2005. The streambanks were live staked and supplemental planting, with appropriate tree species, was performed on several remediation areas. The supplemental planting areas are noted in the as-built plans for the Wiggins Mill Mitigation Site dated February 9, 2005. These areas included plots 3, 4, 5, 6, 7, and 8. This report reflects the new at-planting counts for these plots.

The stream channel was visually monitored on September 20, 2005. The monitoring indicated that the streambanks were stable with substantial woody and herbaceous vegetation throughout the entire length of the stream. Some of the species noted along the streambanks included black willow, buttonbush, silky dogwood, *Juncus* sp., woolgrass, *Baccharis* sp., and various grasses. Photos 9 through 25 show the conditions of the stream.

NCDOT proposes to discontinue vegetation and channel stability monitoring at the Wiggins Mill Mitigation Site.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

For the fifth year of hydrology monitoring, all twenty-two groundwater gauges exceeded the success criteria by showing saturation within 12" of the surface for greater than 5% of the growing season (twenty gauges exceeded 12.5%).

Eleven vegetation plots were established to monitor the 84 acres planted in trees on the site. The 2005 vegetation monitoring revealed an average density of 509 trees per acre, with two of the eleven plots not meeting the success criteria. The overall average density is above the minimum success criteria of 240 trees per acre.

Stream remediation work was initiated in November 2004 and was completed in February 2005. The streambanks were live staked and several remediation areas were supplementally planted with appropriate tree species.

The stream visual monitoring indicated that the streambanks were stable with substantial woody and herbaceous vegetation throughout the entire length of the stream.

An on-site agency meeting was held in August 2005 to review the stream remediation work. During the site visit, the following were reviewed for agency approval: the new log vane structure installations, the streambank repair areas, the open water habitat areas, and the remedial planting. Following the stream monitoring for the 2005-monitoring year, the agencies agreed that NCDOT could propose to discontinue monitoring of the stream.

Based on the hydrologic, vegetation, and streambank monitoring, the Wiggins Mill Mitigation Site met the success criteria for the site during the 2005-growing season. The site has demonstrated both hydrologic and vegetation success for five consecutive years. NCDOT proposes to discontinue all monitoring on the Wiggins Mill Mitigation Site.

APPENDIX A

GAUGE DATA GRAPHS

APPENDIX B

SITE PHOTOS AND
PHOTO AND PLOT LOCATIONS MAP

Wiggins Mill

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5 Photo 6

2005

Wiggins Mill

Photo 7

Photo 8

Photo 9 (Stream)

Photo 10 (Stream)

Photo 11 (Stream)

Photo 12 (Stream)

2005

Wiggins Mill

Photo 13 (Stream)

Photo 14 (Stream)

Photo 15 (Stream)

Photo 16 (Stream)

Photo 17 (Stream)

Photo 18 (Stream)

2005

Wiggins Mill

Photo 19 (Stream)

Photo 20 (Stream)

Photo 21 (Stream)

Photo 22 (Stream)

Photo 23 (Stream)

Photo 22 (Stream)

2005

Wiggins Mill

Photo 23 (Stream)

Photo 24 (Stream)

Photo 25 (Stream)

2005

WIGGINS MILL MITIGATION SITE
Planting Zones, Photo Points, and Vegetation Plots

■ Vegetation Plots
Ⓟ Photo Points

WIGGINS MILL PLANTING COMMUNITY LEGEND

TYPE	SYMBOL
HEADWATER FOREST	
BOTTOMLAND HARDWOOD	
SWAMP HARDWOOD	
SMALL STREAM SWAMP (1ST ORDER)	
SMALL STREAM SWAMP (2ND ORDER)	
BOTTOMLAND HARDWOOD ENHANCEMENT	EXISTING WOODS